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THE ART OF Hatching and Bringing up DOMESTIC FOWLS,

By means of Artificial Heat.

BEING

An Abſtract of Monſieur *de Reäumur*'s curious work upon that ſubject; communicated to the Royal Society, in *January* laſt.

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Tranſlated from the French.

LONDON,
Printed for C. Davis, Printer to the *Royal Society*,
over-againſt *Gray's Inn* Gate, *Holbourn*.
MDCCL.

G.R. III
BR. MUS

THE
ART
OF
HATCHING and BRINGING up
DOMESTIC FOWLS,
By means of ARTIFICIAL HEAT, &c.

THE very curious work of which I am here going to lay a ſhort abſtract before the Society, is entitled, *The Art of hatching and bringing up, in all ſeaſons, domeſtic fowls of all ſorts, by means of the heat of either dung or of ordinary fires,* printed at *Paris* in 1749, in two volumes in twelves: and the author of it, *Monſieur de Reaumur* of the *Royal Academy of Sciences* at *Paris, Commander* and *Intendant* of the *Royal* and *Military Order* of St. *Louis,* and *Fellow* of the *Royal Society,* has diſtributed it into two parts, into which indeed it naturally divides itſelf. The firſt of theſe contains the neceſſary inſtructions for the hatching of the eggs of domeſtic fowls, and even thoſe of all other ſorts of birds whatſoever; and the other teaches how the young brood when hatched may be brought up, though entirely deſtitute of the aſſiſtance of any hens of their own ſpecies.

VOL. I. *Diſc.* I.

The firſt volume conſiſts of ſix diſcourſes, which contain all that is neceſſary to explain the firſt part of the deſign. The ſecond volume contains only four, whereof the two firſt give all the inſtructions requiſite, for the raiſing and feeding the young birds, ſo that they may in no ſort feel the want of their natural parents: the third ſhows the uſes to which this new practice may be further extended; and the fourth ſets before thoſe, who ſhall have accuſtomed themſelves to take pleaſure in the raiſing of poultry, a ſketch of the ſeveral amuſements they may occaſionally meet with in this practice, ſome of which are both uſeful and profitable, and the reſt at leaſt, very curious, inſtructive, and entertaining.

The manner in which eggs are hatched in *Egypt*, is well underſtood, only by the inhabitants of one ſingle village, and thoſe that live at a ſmall diſtance from it, about twenty leagues from *Cairo* in the *Delta*, which village is called *Bermè*. The *Bermêans* inſtruct their children in this art, and carefully conceal it from ſtrangers; towards the beginning of autumn they ſcatter themſelves all over the country, where each perſon among them is ready to undertake the management of an oven. Mr. *de Reäumur* gives an exact deſcription of theſe ovens, which are of very different ſizes, but in general capable of containing from forty to fourſcore thouſand eggs. The number of theſe ovens is about three hundred and eighty ſix, up and down the country, as is collected from the tax that every *Bermêan* is obliged to pay to the *Aga* of the place, for leave to ſet up an oven: and they uſually keep their ovens working for about ſix months. As therefore each brood takes up in an oven as under a hen, only one and twenty days, it will be eaſy in the ſix months to hatch in every oven eight different broods, and thus the three hundred and eighty ſix ovens will give yearly, three thouſand and eighty eight broods of chickens. Every *Bermêan* is only under the obligation of delivering to the perſon that ſhall have entruſted him with an oven, two thirds of ſo many chickens as there ſhall have been eggs put under his care, and he is ſuppoſed to be a gainer by his bargain, as there come ordinarily more than two thirds of the eggs to good. Mr. *de Reäumur*, to make a calculation of the number of chickens ſo hatched yearly in *Egypt*, ſuppoſes only that two thrirds of the eggs are hatched, and that each bood is of no more than thirty thouſand chickens: and thus it would appear that the ovens of *Egypt* give life yearly to at leaſt fourſcore and twelve millions ſix hundred and forty thouſand of thoſe animals.

A *Great Duke of Tuſcany* formerly procured a *Bermêan* to come over to *Florence*, where he hatched chickens in the ſame manner, and as well as in *Egypt*: and the late *Duke of Orleans*, ſome years ſince ſent to the French Conſul at *Cairo*, a ſet of queries drawn up by Mr. *de Reäumur*, concerning the manner of their hatching of eggs there without the aſſiſtance of hens, and thoſe queries produced the memoir of *Father Sicard*, which contained very many curious and uſeful inſtructions.

The ſecret of the *Bermêans* in *Egypt* cannot conſiſt in the conſtruction of their ovens, for theſe are public and expoſed to the eyes of all the world: the ſecret can only then conſiſt, in the art of preſerving the eggs in thoſe ovens in a due degree of heat: and to get from them this ſecret of theirs, no more ſhould be neceſſary, than only to be well aſſured, by obſervations, of the degree of heat which a hen gives to the eggs ſhe ſets upon. Mr. *de Reäumur* found many years ſince that the degree of heat neceſſary for this purpoſe, was the ſame nearly as that which is marked by the number 32 upon his *Thermometers* *. This degree is nearly that of the ſkin of the hen, and what is remarkable of the ſkin of all other domeſtic fowls, and probably of all other kinds of birds. The degree of heat which brings about the developement of the Cygnet, the Goſling, and the Turky-pout, is the ſame as that which fits for hatching the young *Canary* ſongſter, and in all probability the ſmalleſt humming bird. The difference is only in the time during which this heat ought to be communicated to different birds. It will bring the *Canary* bird to perfection in eleven or twelve days, whilſt the Turky-pout will require twenty ſeven or twenty eight.

It is again to be remarked, that this ſame degree of heat is alſo nearly the heat of the ſkin of quadrupedes, and even of that of our own ſpecies. And therefore the Empreſs *Livia*, as *Pliny* relates, might truly hatch a chicken in her boſom, if ſhe had but the patience to keep there an egg, for the ſame number of days as it ought to have continued under a hen. A lady that was known to Mr. *de Reäumur* in the ſame manner alſo, hatched in about ten days the eggs of a goldfinch.

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* As the *Thermometers* made in *London* do not ſo commonly follow Mr. *de Reäumur*'s Scale as that of *Fahrenheit*; it may be proper here to obſerve, that the degree of heat which Mr. *de Reäumur* expreſſes by the number 32, is the ſame which *Fahrenheit* expreſſes by about 96. But as the diviſions are ſmaller in the *Thermometers* of this laſt than in thoſe of the former, the ſeveral other degrees of heat which Mr. *de Reäumur* here expreſſes by the numbers 28, 34, 36, and 40, are the ſame that would have been reſpectively expreſſed by 92, 100, 104, and 110, very nearly upon *Fahrenheit*'s inſtrument.

It would not be eaſy to imitate actually in *France* or elſewhere, exactly what is practiſed in *Egypt*. In what villages ſhould we meet with forty or fifty thouſand eggs together, and thoſe alſo not too long kept, as they do in the *Delta*? Hens are there become ſo very numerous, that according to *Father Sicard*, their eggs are not worth above two ſhillings or half a crown of our money the thouſand. Nor could we ever attain to make hens and eggs as plentiful among us, as they are in *Egypt*, if we had no other ways of hatching our eggs but that of ſetting them under the hens. There are not more than the fourth, or the third part at the moſt of our hens, that are diſpoſed to ſet every year: and thoſe that are, are not for the moſt part ſo diſpoſed at thoſe ſeaſons we would the moſt deſire. We want therefore to help nature in this caſe, as we do in many others. We ſhould be very ill provided with wines, with fruits, with herbs, and with roots, if we were only to content ourſelves with ſuch as are produced without art and cultivation. Eggs and domeſtic fowls make alſo a conſiderable part of the proviſion for our ſuſtenance: and it therefore imports us to encreaſe the plenty of them as much as we are able.

The greater number of the hens which do ſet, would even then be laying eggs if they did not, and they are uſually employed for near three months, in the ſetting and following of their chicks. It will not ſure be too much to ſuppoſe, that in that time they might otherwiſe have laid about thirty eggs. And thus every hen that ſets may be looked upon, as coſting thereby the price of thirty eggs, and ſhe ſeldom in that time hatches more than fifteen. It therefore coſts the value of a hundred thouſand eggs, to ſet fifty thouſand: that is to ſay a hundred pounds ſterling, in thoſe countries where eggs ſell for three pence a dozen, and fifty pounds where they are ſold for three half pence. Whilſt it would be but a ſmall part of that ſum, that it would coſt, if we could hatch the ſame number of eggs, in the ſame manner as the *Egyptians* do.

Mr. *de Reäumur* does not however promiſe himſelf, that he ſhall very ſoon ſee the *Egyptian* ovens brought into common uſe in *France*. The difficulty of gathering together a ſufficient quantity of eggs ſufficiently freſh and new laid, the prime coſt of building the ovens, the want at firſt of perſons capable of directing the management of them, and the trouble of forming others to the knowledge of it, are obſtacles he ſays not eaſy to be removed; without a far greater zeal than mankind commonly have, for the promoting with any trouble to themſelves, what may be of uſe to the public. He has therefore ſought for another analogous method of hatching chickens, either in great or in ſmall numbers; a method which ſhould require no preliminary expence, which ſhould be eaſy to be practiſed in the country, and by the moſt illiterate ſort of people: but which might at the ſame time procure both agreeable and uſeful amuſements, to perſons of a higher rank, to ſuch as ſhould be capable of taſting the various entertainments which nature affords, in the rearing of young animals, and who would conſequently be pleaſed with ſeeing their back yards ſtocked with variety of fowls and birds of ſeveral kinds: and who would not think that their time and care was in this way leſs well beſtowed, than in the cultivation of the fruit trees, and greens, in their orchards and kitchen gardens, or of the flowers in their parterres. And ſure, ſays he, ſuch perſons who ſhall have a genius capable of apprehending, that every occupation is ennobled by the uſe it may be of to ſociety, will over and above be ſenſible that animated beings, ſuch as birds of all ſorts, cannot fail of preſenting, yet *more* curious and ſatisfactory obſervations to a philoſophical mind, than even thoſe which are ſo plentifully afforded by the others, which in the ſcale of beings riſe no higher than the vegetable world.

Mr. *de Reäumur* is indeed of opinion, that after ſome time, it would be poſſible to hatch as great a number of chickens in *France*, as they do in *Egypt*, and that, without the trouble of bringing over *Berméans*, without the expence of building ovens like theirs, and without any charge in combuſtible materials. He is perſuaded that the heat upon other accounts to be given to their ovens, by the bakers and the paſtry-cooks, to the furnaces of the glaſs houſes, and thoſe of the ſmelters of metals, might this way alſo be turned to profit. He has already made uſe himſelf of the ovens of three bakers for this purpoſe, and with good ſucceſs. He gives us the deſcription of the ſtoves which he has practiſed over thoſe ovens: and they are exceedingly plain and ſimple. He made uſe of a chamber already ſubſiſting over an oven, in the houſe of the *Community of the Infant Jeſus* at *Paris*, and which he found ſufficiently heated by that oven. This heat was indeed greater than was neceſſary to hatch chickens. There was therefore there nothing

thing wanted, but to moderate that heat, and to keep it conſtantly pretty near to the degree required. *Thermometers*, placed in ſeveral parts of this room or ſtove, ſhewed the heat of the air in it; and when it wanted to be either encreaſed, or diminiſhed, it was ſufficient to encreaſe or to diminiſh the communication of this air with that abroad, by the opening or the ſhutting more or fewer of the paſſages or vents, that were made through the walls. The very firſt experiment that was made in this ſtove ſucceeded, and it was afterwards brought to a yet greater ſtate of perfection. One may eaſily ſee, that the ſize and the form of theſe ſtoves, muſt change according to the ſituation of the oven and the ſize of the ſpace above it. It will be enough here to take notice, that the heat of the ovens which are not heated every day, will yet, if well huſbanded, be ſufficient to anſwer the purpoſe: and that there has been no occaſion at all, to add the leaſt heat to thoſe ovens, the days there was no bread baked in them.

From the very great number of ovens that might thus be employed, it is eaſy to ſee, that it would be practicable by their means to hatch an immenſe number of chickens: and it will be ſeen in the ſequel, with what eaſe Mr. *de Reäumur* propoſes alſo to rear thoſe chickens. A baker's wife might with great conveniency, and with very little expence, in this manner bring up and feed a very great number of chickens, during the firſt weeks of their lives: whilſt the country folks who ſhould bring to market large chickens to ſell, would ſurely be glad of the opportunities of buying up in the towns little ones, to carry back and to keep, till they ſhould alſo become ſaleable at market in their turn. In country places where there is no oven, and where wood is cheap, a little room might be made uſe of, in the middle of which might be placed a ſmall ſtove. Mr. *de Reäumur* gives the deſcription of ſuch a little room, and which he had alſo himſelf made uſe of, with good ſucceſs for this purpoſe.

Diſc. II.

Mr. *de Reäumur* had not yet thought of the uſe which might be made of bakers and other ovens, for the hatching of chickens, when he firſt attempted to perform the ſame by the heat of dung. He judges himſelf, that he ſhould hardly have taken ſo much pains, as he has really taken, to overcome the great difficulties, which preſented themſelves in the courſe of this undertaking; if he had then known, that he could ſo eaſily have made uſe of the heat of common ovens. We ſhould then have loſt the very intereſting and curious obſervations, which he made, whilſt he was conquering of thoſe difficulties. And this example, added to ſo many others, which the works of this excellent perſon afford us, cannot but give us the greateſt ſatisfaction, to find that in all his attempts to advance and improve natural hiſtory and natural knowledge, he has at laſt got over difficulties, which at firſt appeared inſurmountable, and many of which could hardly have been poſſibly removed, without ſuch a degree of patience, and ſuch a ſagacity, as very few perſons beſides himſelf, have ever been endowed withal.

Several antient authors have related, that eggs might be hatched by the keeping them in dung, but none of thoſe authors have told us that they had ever practiſed it themſelves. Mr. *de Reäumur*'s obſervations prove to us beyond all doubt, that if they had attempted it, they would never have ſucceeded in it; if they had contented themſelves ſimply with lodging of the eggs in dung, as they ſay that it was practiſed.

Dung is indeed capable of acquiring a much greater degree of heat, than that which is neceſſary for the hatching of Eggs: and Mr. *de Reäumur* has put eggs into an earthen pot, and lodged them in a layer of dung, where they have been almoſt ſtewed or parboil'd. The firſt ſtoves with dung which he made uſe of, were ſomewhat of the form of the hot beds in our kitchen gardens: they were ſhallow, longer than broad, cover'd and ſunk into the dung. Two of the firſt eggs that had been put into this ſort of bed, ſhewed at the end of twenty four hours, the beginning or the developement of a germ. This firſt appearance of ſucceſs gave great hopes, and thoſe hopes encreaſed during the following days; but after that an infected ſtench from ſeveral of the eggs gave notice that their germs had periſhed in them. Theſe accidents were then almoſt continual, and Mr. *de Reäumur* had the diſpleaſure to find, that every one of his chickens were loſt before the day came on which they ſhould have been hatched: and he had reaſon to be of opinion, that ſeveral of them had died by being expoſed to too great a degree of heat. He applied himſelf therefore to regulate yet more and more the heat of his ſtoves, yet when he was thus well aſſured that this heat had conſtantly been kept at the degree requiſite; he had again the diſſatisfaction to find himſelf diſappointed in his expectation of ſeeing his chickens hatch. At laſt after the loſs of a very great number, he diſcovered that it was the vapour exhaling from the dung, that was the cauſe of their death. This vapour was very conſiderable, and eaſy to be perceived upon the ſide of the ſtove, and ſometimes even upon the eggs themſelves.

Mr. *de Reäumur* then ſet himſelf to contrive matters, ſo that the eggs might be heated by the dung without being expoſed to its vapour. He totally changed the figure of his ſtoves. He made uſe of a caſk, which he partly ſunk upright into a bed of dung, and the other end, which was uppermoſt he opened for the ſetting into it baſkets filled with eggs, but he could occaſionally cloſe it either more or leſs, as there was need to encreaſe or to diminiſh the heat of the air, within the body of the caſk. The term now paſſed, before the expiration of which, Mr. *de Reäumur* had ſo often found his eggs to be all deſtroyed, and none of thoſe that had been now placed in his new ſtove had as yet given the leaſt token of corruption. On the 20th day, the little chicks began to peck their ſhells, and to make their voices heard; and the next day ſeveral were compleatly hatched and came out. One will eaſily judge of the pleaſure it gave him, to ſee at laſt the ſucceſs of an experiment, he had ſo often repeated in vain, and that during the courſe almoſt of a whole twelvemonth, before he was fortunate enough to ſee one ſingle egg hatched by the heat of the dung. He had now every day the freſh pleaſure to ſee many chickens come forth, from the firſt batch of eggs he had placed in the caſk. He was nevertheleſs ſtill to be expoſed to the diſpleaſure of loſing many broods, either totally or in part; of ſeeing the chickens of very many eggs die when they were almoſt come to the time they ſhould naturally be expected to ſee the light. But theſe accidents ſo often reiterated, at length diſcovered to him, that even when there was not in the ſtove ſuch a degree of moiſture as to diſcover itſelf by ſenſible drops upon its ſides, it might nevertheleſs be ſtill filled with a vapour, that might ſooner or later prove fatal to the young embryos. His following diſſertations ſhew the means of removing the ill effects of this vapour, and all the other obſtacles, which had ſo long ſtopt him in the progreſs of his experiments. The whole at laſt comes to no more, than to a ſmall number of very eaſy and very ſimple practices and cautions; and thoſe ſuch as require nothing, beyond the moſt ordinary talents and underſtandings of common country people. Upon which occaſion Mr. *de Reäumur* takes notice, that he ſhould have been aſhamed himſelf to have made ſo many fruitleſs trials, before he could arrive at ſuch eaſy and ſuch obvious and commodious ways of ſucceeding: if the experiments of different ſorts, to which he has now applied himſelf for ſo many years, had not abundantly taught him, that the ſlighteſt difficulties, even ſuch as may ſeem at the firſt very eaſy to remove, have nevertheleſs often been capable of giving long delays to his enquiries: and that it is indeed very rare, that we are at the firſt enabled to conſider objects, in that light, in which we ought really and truly to conſider them.

Diſc. III.

Monſieur *de Reäumur* had only given, in his ſecond diſcourſe, the general idea of his manner of hatching chickens, in ſtoves heated with layers of dung; but he gives in the three following, both the theory and the practice of this art, in a more circumſtantial manner. It was not till after he had made a great variety of experiments, and thoſe with very different ſucceſs, that he became himſelf entirely maſter of it. The experiments that had ſucceeded the beſt, and thoſe that had been the moſt unfortunate, had both been equally uſeful to him, and it was only by the compariſon of thoſe with each other, that he was perfectly enabled to know what was fit to be practiſed, and what was neceſſary to be avoided. The firſt part of this practice requires the knowledge how to make and to diſpoſe the ovens or ſtoves, in which the eggs are to be placed: but this is not what is the moſt difficult, the care which theſe ſtoves require in their management, and the precautions that are to be taken about them, to make the main operation ſucceed, is what is the hardeſt and what requires the greateſt delicacy. Yet is all that to be got over, by the means of a very few, and thoſe very eaſy precepts; and the ſeveral facts upon which the natural and phyſical obſervations are founded, which naturally lead to thoſe precepts, are diſtinctly delivered in the third and fourth diſſertations.

It is proper to have, at the ſame time, two ſtoves at the leaſt to relieve each other: that if at any time the air in one of them is too much cool'd, or that any other accident has happen'd to it, the eggs may be immediately removed into the other. Theſe ſtoves are to be placed where they are covered from the rain, but where the air may have a free and continual circulation, that the vapours which exhale from the dung may be regularly and conſtantly carried off: care is however to be taken, that through too much attention to the changing of the air, it may not by that means be ſuffered to become too cold.

It is proper to coat the inſide of the caſks with plaiſter, that the vapours of the dung in which they are to be ſet, may not penetrate through their joints: or one may inſtead of plaiſter, line the inſides of the caſks with thick paſted paper, or with plates of tin, or indeed one may even make the whole ſtoves of ſuch plates, in which laſt caſe they would alſo be the eaſier to heat, and to preſerve in a proper temper.

Nevertheleſs Mr. *de Reäumur* has had chickens hatched in caſks abſolutely unlined, and it is therefore only for greater ſecurity that he adviſes theſe precautions to be made uſe of. The lower ends of the caſks are to reſt upon a bed of hot dung, of the thickneſs of a foot and a half, or of two feet, and the outer ſuperficies are to be ſurrounded with another like bed, at the diſtance of about two feet from their circumference. The ovens or ſtoves thus formed, are to be conſider'd as ovens whoſe mouths look upwards; and the covers which ſerve to cloſe theſe mouths, are to be made of ſeveral pieces, by means whereof they may be more or leſs ſhut up, as the regulation of the heat may happen to require.

Mr. *de Reäumur* made uſe of caſks of about half a hogſhead, or a hogſhead in content. New dung in which the ſtraw is mixed with the ſoil is the beſt for the heating of the ſtoves: And one ſhould always be provided with a heap of ſuch dung, to give them freſh heat, whenever they appear to have a diſpoſition to cool. One may either uſe the dung of horſes, or that of cows or of ſheep. They frequently make in the country dunghils by art, compoſed of weeds or other uſeleſs greens, mixed up with a little true dung: and Mr. *de Reäumur* has obſerved that theſe dunghils alſo, have preſerved for ſeveral months together, a degree of heat more than ſufficient to hatch eggs. One may therefore upon occaſion make uſe of this ſort of dung as well as of any other, or even of tanners bark.

Diſc. IV.

It is from the Thermometer that the heat of the ſtoves is to be learned, and it is eaſy to inſtruct the moſt ignorant, in the uſes of this inſtrument. It will be ſufficient in the Thermometers which are to be put into the hands of country people, that thoſe terms only be noted, which they are to be made acquainted with. It will be proper to try a thermometer before it is uſed; and that either by comparing it with another of known goodneſs, or by keeping its ball for about a quarter of an hour under one's arm: and by this means one may even change one of the worſt thermometers into ſuch a one as may ſafely be confided in. Since it will only be neceſſary to note the place where the fluid within it ſtands, at the moment when it is taken from the boſom.

Monſieur *de Reäumur* has alſo contrived a ſort of thermometer, which any one may himſelf eaſily make or provide: take only a lump of butter of the ſize of a walnut, melted with half as much tallow, and put them together in a ſmall tranſparent vial. The heat of the ſtove will render the mixture in the bottle as liquid as oil if it is too great, or the lump will remain fixed in one place if it is too ſmall, but it will flow like thick ſyrup upon inclining of the bottle, if the ſtove is of a right temper: all which one may further be aſſured of, by trying the heat of the bottle in one boſom, as was before obſerved.

It will take two or three days to give to a new ſtove the proper degree of heat: and it is not till after one has aſſured one's ſelf of that degree, and that the inſide of the caſk is ſufficiently dry, that one ſhould venture to place the eggs in it: and theſe eggs ſhould not beſides have been kept too long, though they may be kept ſomewhat longer in the winter than in the ſummer ſeaſon. They may be put into ſhallow baſkets, whoſe diameters are proportioned to the width of the caſks they are to be placed in; and one may ſafely lay two tires of eggs upon one another: but that which is to paſs when the eggs come to hatch, requires that the eggs in the upper layer, ſhould not lie ſo cloſe to each other as thoſe in the lower.

It will not be neceſſary at the firſt to fill the baſket with eggs; freſh ones may be put in daily, as the hens happen to lay them: and then it may be of uſe, to write near the ſmall end of each egg the date of the day when it was firſt placed in the ſtove.

The natural poſition is for the eggs to lie along, they will hatch nevertheleſs in whatever poſture they ſhall have been placed.

One baſket of the ſize to go eaſily into a caſk of a hogſhead, will conveniently hold about a hundred and fifty eggs; and when one is but beginning to make experiments, it may be proper not to put more than one baſket into a ſtove at the ſame time.

It will ſometimes happen, that the heat ſhall be equal from the bottom of the ſtove, to within three or four inches of its top; but at other times it will be found different at different heights. The beſt place is commonly a few inches higher than the middle of the caſk; and that is where the baſket, when there is but one, ſhould be placed: when two or three baſkets are to be put in at a time, a little more care muſt be taken to regulate the heat, and a little diſtance ſhould be left between each baſket.

The heat is always very nearly the ſame through the whole extent of a baſket; when there is any difference, it is the middle of the baſket that is the hotteſt.

The heat of the air in a ſtove is always diminiſhed, when a new baſket is placed in it, for the eggs which it contains are colder than that air; therefore to warm the ſtove again, a great part of its opening is to be cloſed, but it muſt not be quite ſhut up, becauſe that the circulation of the air is never to be entirely intercepted. It ſhould not then be left above an hour without examining its heat by the Thermometer, to know whether its mouth is to be continued equally cloſed; and it will be proper to repeat that examination every hour, for five or ſix hours ſucceſſively.

It will not after that be neceſſary to make ſuch frequent viſits to the ſtove, when the heat ſhall have been once brought to its proper degree and fixed at it. It will then be enough to ſee five or ſix times in a day in what condition it is, at night as late as may be convenient, and as early in the morning. Yet there may be circumſtances when it may want to be viſited even in the night.

Sudden changes from cold to heat, and from heat to cold, in the air we breath, muſt alſo produce like changes in that contained in the ſtoves. They will therefore in ſuch circumſtances require a double attention; and the ſame will alſo be neceſſary in very moiſt weather: for ſuch weather ſometimes cauſes a fermentation in the dung, which occaſions it to heat, more than one would readily have expected.

Some days after the eggs ſhall have been placed in the ſtove, it will probably be obſerved that the liquor in the *Thermometer* will not be kept at its due height, without keeping the mouths of the caſks more cloſed than during the preceding days: and this decreaſe of the heat within the ſtoves, will be an indication that the bed of dung upon which they ſtand has alſo cooled, and that its heat wants to be renewed. But this operation is no ways difficult to perform, it will only require that a thin bed of very warm freſh dung ſhould be ſpread all round about the caſks. During the hot and even the temperate months of the year, it will be ſufficient thus to renew the heat once a week, in the cold months it will not be too much, to do it every three or four days.

Great attention ſhould be given to the ſtoves for ſome hours, after freſh dung ſhall have been thus applied, for the heat may ſometimes happen to encreaſe to a very conſiderable degree.

One may alſo heat the dung already uſed, by the moiſtening of it, for the fermentation will thus be renewed, that was before extinguiſhed, and that will be quickened that was only become too weak.

When the heat of a ſtove ſhall be conſiderably diminiſhed, and it might be dangerous to wait for the effect of the freſh dung, one may put into the ſtove itſelf a pan of warm aſhes with a few lighted embers.

That the eggs may equally ſhare the irregularities there may be of the heat, in a ſtove wherein there are ſeveral baſkets together, thoſe baſkets may be made every day to change their places: one may alſo turn every baſket a quarter or half round about, that ſo every portion of its circumference may as much as may be change its place, with regard to the ſides of the ſtove.

By making the eggs thus to change their ſituation, one will but imitate what the hens themſelves do by thoſe upon which they ſet, and their natural actions are ſurely to be attended to, as the moſt proper to inſtruct us upon this ſubject. Hens are frequently ſeen to make uſe of their bills, to puſh to the outer part thoſe eggs that were neareſt to the middle part of their neſts, and to bring into that middle part, ſuch as before lay neareſt to the outſide of the ſame.

Here follows one of the experiments which Mr. *de Reäumur* made, to aſſure himſelf of this proceſs in a hen; he ſet under one twenty two eggs, which were diſpoſed upon one another in three tires. They were all well ſet upon, for from the twenty two eggs he had nineteen chickens. He had numbered them all, and had placed the firſt numbers 1, 2, 3, 4. in the bottom of the neſt; and the eggs marked with the following figures were placed upon them: but at the end of two days, there remained no ſigns of the order in which he had placed them, the loweſt numbers were uppermoſt in the neſt, and the higher numbers were now the loweſt. This labour was conſiderable for the hen, ſhe was as it were to draw eggs out of a hole to remove them to the top of her heap; and ſhe muſt therefore have been prompted to take this trouble by the neceſſity of it to her main end: but when the hens themſelves firſt diſpoſe their eggs to be ſet upon, they are placed all in one and the ſame tire, and conſequently are then much more eaſily removed.

If hens went often off from their eggs, or that they left them for any conſiderable time together, they would be much more cooled, than what they can bear without danger. They muſt nevertheleſs leave their eggs to feed, but they generally content themſelves with only one meal a day, and in that meal they ſeldom employ more than ten minutes or at moſt a quarter of an hour.

The reflections to be made upon the degree of cooling, to which eggs are expoſed in the ordinary courſe of nature, give us reaſon not to be too ſolicitous about the apprehenſions we might otherwiſe have, from the ſmall variations that are inevitable in the heat of our ſtoves. Nature has happily not required the greateſt preciſion, in the means ſhe makes uſe of for the bringing about her operations. It is with degrees of heat, very unequally diſtributed, through different years, that ſhe cauſes plants to vegetate, and that ſhe furniſhes us with fruits, and the ſeveral ſorts of grain. And thus there is a latitude alſo in the degrees of heat, both above and below that marked with the number 32 upon the Thermometer, that is no way deſtructive to the chickens in the eggs. It appears by Mr. *de Reäumur*'s experiments, that the fluid may fall to thirty, or riſe to thirty four, without being detrimental, nay he has had ſome eggs hatched, that had been expoſed at times to a heat of only twenty eight degrees, and others to that of forty.

Yet muſt one not be ignorant, that chickens have often been killed by too great a degree of heat of ſome continuance, whilſt others that have been equally expoſed to the ſame have held out againſt it. The exceſs of heat is more to be apprehended for chickens that are near to the time of their hatching than it is for others. When the heat that has been continual in the ſtoves, without riſing much higher, has been kept at thirty three or thirty three degrees and a half, the chickens, far from ſuffering by it, have on the contrary been hatched a day or two ſooner than was expected. And again, when the heat has been only ſuffered to riſe to about thirty one degrees or a little leſs, the chickens have been hatched about a day or two later, than they would have been hatched by a hen.

There is made a conſiderable evaporation from the interior parts of an egg whilſt it is ſet upon, or whilſt it continues in the ſtove: and it generally has ſuffered the loſs of about one fifth part of its firſt weight, by ſuch time as the chicken has been ready to hatch.

No developement of the embrio will be made in an egg from which nothing can perſpire, nor will there be any alteration made in it, as appears by the following experiment. When the ſhell of an egg is covered with a varniſh that choaks up its pores, it may be kept under a hen more than thirty or forty days, without being at all corrupted, or having the young embrio in the leaſt advanced.

Among the chickens of the ſame brood, either hatched in a ſtove or under a hen, there are ſome that will come forth about a day ſooner, and others about a day later than the uſual term; and this probably happens from the ſhells not being always equally hard, whereby the requiſite tranſpiration, is in ſome performed a little ſooner, and in others a little later than ordinary.

One muſt be but little acquainted with the ſeveral uſes of the ſhells of eggs, if one barely looks upon thoſe ſhells, as caſes to contain the eggs, and to keep them from being bruiſed or broken under the hen. They ſerve beſides to prevent too quick and too abundant a perſpiration of the within contained fluids: and an egg without a ſhell, can neither be preſerved nor hatched, but will be dried up in a very ſmall time.

Diſc. V.

It has already been remarked, that the varniſh with which eggs may be coated, occaſions their germs never to unfold, becauſe their perſpiration is in that manner prevented: and this may ſerve to give us ſome idea how it comes about, that moiſture is ſo pernicious to the little chicks that are ſtill in their eggs; for this moiſture in ſome degree hinders the perſpiration of thoſe eggs.

Mr. *de Reäumur* aſſured himſelf by an experiment, that water was alone capable of preventing eggs from being hatched with any ſucceſs. He placed eggs in a pan filled with water, the pan was ſet in a ſtove, and the water was conſtantly kept to its due degree of heat, but the germs in the eggs were never at all unfolded.

When the moiſture in the ſtoves has been conſiderable, the chickens have conſtantly periſhed very early, when that moiſture was ſmall they did not periſh till later, and ſometimes not till they were juſt ready to hatch. The chicken in this laſt caſe takes its encreaſe, but without that vigour and ſtrength which ſhould enable it to pierce the walls of its firſt dwelling and to come forth: ſo that it has conſtantly periſhed before it came to ſee the light.

The egg which is hatching does not only tranſpire, but it inſpires alſo. We know the meaſure of the quantity of the matter, that has tranſpired from the different ſubſtances of the egg, by the void that is found at its larger end, and which viſibly encreaſes every day: and this void is filled again by the air which the ſhell gives an admittance to from without. Yet is it not the air only that penetrates through the pores of the ſhell, thoſe pores will alſo let in the infected vapours that are capable of deſtroying the chickens in their ſhells, and of making them rot. One rotten egg left under a hen for four and twenty hours, is ſufficient to occaſion the deſtruction of a whole brood: and one of the conſtant occupations of the *Bermêans* in *Egypt*, is to remove upon that account from time to time the eggs that become rotten out of their ſtoves.

A moiſture that is barely of a watry nature, does not cauſe the ſubſtances of the eggs to corrupt, unleſs it is very exceſſive: but a much leſs degree of moiſture, when it is charged with thoſe particles of the dung that are capable of offending our ſmell, never fails to produce in the eggs ſuch a corruption, as deſtroys and diſſolves the young embrios. Yet has Mr. *de Reäumur* aſſured himſelf by experiments, that even the ſmell itſelf of the dung, is only injurious to the chickens when the air that carries it is alſo loaded with a certain quantity of moiſture.

The time probably in which a free perſpiration is moſt neceſſary to the chickens, is that when it will very ſoon become neceſſary for them to breath: for it is juſt then that above three fourths of thoſe periſh, which have been expoſed to damp, and which are thereby deſtroyed in their eggs. The voice and the cry of the chickens which are heard, before one can perceive even the leaſt opening or crack in their ſhells, is a proof that they begin to breath before their ſhell is opened.

It ſeems to be chiefly the long continuation of the action of the air charged with vapours, that is noxious to the eggs. What that vapour ſhall not have been able to do in eight or ten days, it will be able to accompliſh in twenty. Mr. *de Reäumur* has taken eggs that had been already ten, twelve, or fifteen days ſet under a hen, and he has then put them into a ſtove, which encloſed ſome of theſe noxious vapours: yet have the chickens been hatched from theſe eggs, as if they had continued under the hen; whilſt thoſe which ſhould have come forth at the ſame time, from the eggs that had continued all along in the ſtove, were all found dead in their ſhells, though otherwiſe as large and fair to appearance, as they ſhould naturally have been.

Mr. *de Reäumur* has ſaved the lives of ſeveral chickens, by making a ſmall opening in the ſhell at the larger end, about the ſeventeenth or the eighteenth day. He by this means introduced into the egg the air neceſſary to the chicken, and which the vapours that clogged up the pores had intercepted: but this operation is hurtful, if it is performed upon eggs that have been ſet leſs than fifteen days.

The true way to preſerve the lives of the chickens in the eggs, is to prevent the air which fills the cavity of the ſtoves from being too much charged with vapours; and theſe vapours, as has been obſerved, are ſometimes imperceptible and yet pernicious. It would therefore be neceſſary to have a *hygrometer*, by means of which one might know when there is moiſture in the ſtove. Mr. *de Reäumur* has found one of a very ſimple and eaſy kind: he only lays into the ſtove a cold egg, and a quarter of an hour after, he examines whether its ſhell is become moiſt. If it has remained dry, it will be a proof, that there is not in the ſtove any damp to be apprehended. But if on the contrary the ſhell is become wet and that it continues ſo for ſeveral hours, it will be hazardous to ſet any eggs in that ſtove.

Mr. *de Reäumur* then teaches ſeveral ways of diſſipating the vapours in the ſtoves.

The matter which tranſpires continually from the eggs, is itſelf capable of forming a vapour that may become noxious to theſe ſame eggs, when the air in the ſtove is too much charged with it: and that circulation which ought conſtantly to be preſerved in the ſtove, is the moſt effectual way to remove this inconvenience. It is even apparent that the neceſſity which a hen is under every day, to leave her eggs for ſome time, to take her nouriſhment, is of conſiderable ſervice to thoſe ſame eggs: for the air which ſtagnated under the hen, and which was loaded with the vapours tranſpired from the eggs and from her own body, will thus be again refreſhed and exchanged for other air, that will be of a more pure and wholeſom nature.

Almoſt all the eggs of ſeveral conſecutive broods, have been ſpoiled under a Turky hen, that continued to ſet for three whole months together; ſhe was ſometimes ſeveral whole days without ever leaving her eggs, or getting off of them, and ſhe had her meat and her water given her in her neſt.

All the various accidents we have been ſpeaking of, will perhaps make ſome people look upon the undertaking of the hatching of chickens by the heat of dung, as ſomewhat too difficult to be attempted with any proſpect of ſucceſs. But if a like enumeration had been made of all the ſeveral accidents, that might poſſibly prevent a crop of corn from being ſucceſsful, it is very probable that ſome perſons alſo might have been inclined never to take the trouble of plowing up the ground, or of ſowing in it at a conſiderable expence, large quantities of grain; were they not on the other ſide encouraged to hope for better ſucceſs by daily experiments. Mr. *de Reäumur* will thus alſo encourage us to perſevere in our attempts in the preſent caſe, by the ſucceſs of thoſe trials of his own and other people's, that have ſucceeded to his wiſh, and given him as many chickens as he could poſſibly have expected. In matters where the operations of nature are concerned, what has once ſucceeded will always ſucceed, provided that the ſame circumſtances ſhall again come together: and if thoſe neceſſary circumſtances are but once well known, it will be no hard taſk to ſecure their concurrence.

Diſc. VI.

Mr. *de Reäumur*, to prevent the vapours of the dung from getting into his ſtoves, again invented another ſort quite different from thoſe he had made in caſks. Theſe conſiſted of long cheſts open only at one end, and well cloſed every where elſe, the open ends of theſe cheſts were placed in a room ſeparated by a wall from that where the remaining parts of the cheſts were lodged; and thus the air in the ſtoves was renewed, without having any communication with the air of the room that contained the dung. This idea, ſays he, which one would think ſhould have firſt preſented itſelf, came however but late into his mind; and this has indeed fully anſwered all his expectations. He has already made both with fire, and with the heat of dung, a ſufficiently great number of experiments, to be able to aſſure his readers, that they may not only in theſe ways hatch eggs at abundantly leſs expence than they can have them hatched by hens, but that they may alſo thus, in proportion, have a much greater number of chickens from the ſame number of eggs, than they could have obtained by ſetting them in the common way. Mr. *de Reäumur* has himſelf frequently, from ſmall batches, had as many chickens as he had ſet eggs, though in the larger it is always to be expected that ſome muſt be loſt. Yet the ſiſter *Mary* of the *Community of the Infant Jeſus*, who had applied herſelf with great diligence and exactneſs to the care of her ſtoves, had once from three hundred eggs, two hundred and ninety ſix chickens, ſo that ſhe only loſt four, and even thoſe not till the time when they were actually pecking of their ſhells.

The truly intereſting moment is that when the chickens hatch, and this moment, the ſucceſs of which is to reward thoſe who take the charge of theſe ſtoves, for all their care and trouble, will yet require ſome further attention. Some chickens which would otherwiſe loſe their lives, may be ſtill ſaved by helping them to get out of their ſhells, and that is a piece of aſſiſtance they could not receive from a hen.

The chicken is almoſt a round ball as it lies in its ſhell, the neck is bent and diſpoſed along the belly, and the bill is turned under the wing as we often ſee in birds aſleep. The chicken however in this ſituation is to break its ſhell; and this it performs by ſtrokes of its bill: the firſt effect of theſe ſtrokes is a ſmall crack, for the moſt part between the middle of the egg and its bigger end: the fore part of the chicken points towards that end, and the hind part towards the leſſer. The chicken then, by ſtriking the ſhell with its bill, inſenſibly turns itſelf about from the left to the right, and it is accordingly always from the left to the right, that it prolongs the crack firſt made in the ſhell, till it extends almoſt quite round the circumference of the circle the bill has deſcribed: and it is commonly the work of near half a day, for a chicken to get out of its ſhell. To get out, it puſhes its body forward with its feet, and thus it forces the anterior part of the ſhell to riſe up, and ſo compleats the breaking away the ſhivers that ſtill connect that half ſhell with the inferior one. When it is thus got almoſt quite out, it draws its head from under the wing, where it had till then remained: it next extends its neck, but is ſtill frequently ſeveral minutes attempting, before it has the ſtrength to raiſe itſelf; by little and little it then ſeems to grow ſtronger, and when it has for a little while dragged its legs after it, it at laſt becomes able to ſtand upon them, to ſtretch out and erect its neck, and to carry its head upright.

Vol. II. *Diſc.* I.

It would at the laſt be but a uſeleſs undertaking, to hatch chickens, and thoſe in as great a number as ſhould be deſired, if we could not afterwards promiſe ourſelves to preſerve

ſerve them, and to be able to bring them up. What could be done with ſo vaſt a ſtock of chickens, all as it were brought forth at the ſame time, and all unprovided of thoſe natural parents, which might ſeem ſo neceſſary to them, to keep them warm, and to defend them from the injuries of the weather? This difficulty is not however unſurmountable: for capons have by art been taught to lead about, to watch over, and to cheriſh and keep warm, the chickens that have been entruſted to their care; and that even as well as the hens could have done, under which they might have been hatched. *Geſner*, *Willughby*, and divers other authors who have wrote concerning the œconomy of the country, have related this fact: and Mr. *de Reäumur* deſcribes the manner of forming capons to perform this ſervice. He has himſelf ſeen above two hundred chickens at once, all led about and defended by only three or four ſuch capons: thoſe capons clucked like the hens, to call in the chickens that had ſtrayed too far off; and they again redoubled their call, when they found any nice bits, to invite the young brood to come and pick them up and eat them. Nay Mr. *de Reäumur* has even had a cock among his poultry, which had been formed in the ſame manner as the capons juſt mentioned: and this cock no leſs carefully led about the young chickens he was entruſted with, never neglecting nor leaving them, but when he ſaw a hen diſpoſed to receive his addreſſes; he then indeed ran eagerly to her, but immediately after returned quietly to his chickens again.

The capons and the cocks once ſo taught to tend chickens, will conſtantly after, do it all their lives.

But Mr. *de Reäumur* has not barely been ſatisfied with the aſſiſtance he could thus procure from cocks and capons, in the bringing up of his chickens. He has alſo found the means to raiſe them both by the warmth of the dung, and by that of an ordinary fire: he has even ſhewed the advantages which have reſulted from this laſt expedient; and which are ſuch, that he even thinks there might be again, in the taking away from the hens the chickens they ſhould have hatched themſelves, in order to bring them up, in the new manner which he has diſcovered. He has reared chickens with great ſucceſs in his ſtoves heated with dung; wherein they were fully ſheltered both from the cold, and from all other dangers: and he has alſo brought up others, in much larger rooms, heated either with dung, or with ordinary fires. The heat indeed of theſe laſt rooms, cannot be every where ſo equal as that in a ſtove. It was therefore neceſſary that there ſhould be in each of them ſome particular places warmer than the reſt, into which the young chickens might occaſionally retire as they would under the wings of a hen; and theſe laſt places were a ſort of boxes without bottoms, lined within with furs. He now indeed found, that no natural parent, could be of ſo general a uſe to the young chickens, as theſe artificial parents were, for ſuch he choſe to call them. The chickens would immediately find the benefit of them, they preſently grew fond of them, and took refuge under their ſhelter, with the ſame readineſs as they would have done under the wings of real hens.

One cannot give to theſe artificial parents, all the ſeveral forms one would chuſe, and which might at firſt appear equally proper: and it was not till after Mr. *de Reäumur* had loſt a conſiderable number of chickens, that he became perfectly acquainted with the manner in which they ought really to be made ſo as to prevent the chickens from running the riſque, of being bruiſed to death, or of being ſometimes ſmothered under them.

It will be neceſſary to regulate the heat of the places in which chickens are to be brought up: for too great a degree of heat will as certainly kill the chickens after, as before they are hatched. Mr. *de Reäumur* has had ſome deſtroyed, by being expoſed for ſome time to a heat of thirty eight degrees: and thoſe ſame vapours which, as has been ſeen above, have proved deſtructive to chickens yet encloſed in their eggs, are alſo capable of deſtroying ſuch as are already come forth. Smoak is alſo very pernicious to them. In the coldeſt weather chickens may eaſily be brought up, in theſe rooms ſo heated by art, of which we have juſt been ſpeaking: but in fine ſummer days, and principally when the chickens ſhall have already got over a few weeks, they may ſafely be expoſed to the open air of the court yard. They ſhould then indeed, at the firſt, be put into a large cage, reſting upon the green ſwerd, and expoſed to the ſun: in which likewiſe it would be proper to place one of our artificial parents, to ſhelter them as there ſhould be occaſion; though they ſhould alſo have liberty ty to go out from the cage, and to run about, both to ſeek and to pick up inſects. One might indeed be afraid, that being without a leader, they might diſperſe too far, whereas the clucking of a hen or of a capon, when they are with ſuch, calls back to the flock thoſe that have ſtraggled too far from it. But in truth they love to keep together, and when any one gets at too great a diſtance from its company, it will ſoon diſcover by its cry, that it is in ſome diſtreſs: it will then ſtand ſtill and liſten till it hears the voices of its fellows, which will ſoon bring it back to them again.

Something ſhould now be ſaid of the different ſorts of food that may with conveniency be given to young chickens. A conſiderable part of the yolk of the egg will have been left unconſumed by the little chick in the ſhell, and that part does not enter into the body of the chick, till a very little time before it is ready to break forth; that yolk is there to be digeſted by the young bird, which will conſequently for ſome time be nouriſhed by it: and it is for that reaſon, that chickens are generally more than a day without taking any food after they are hatched. The firſt nouriſhment afterwards that Mr. *de Reäumur* has generally given, has been a few crumbs of bread, and at the end of a few days he has mixed with thoſe crumbs ſome ſeeds of millet, after which it will not be long before they begin to pick up graſs and inſects their ſelves. One may eaſily alſo gather together worms, or inſects to give them; and the heat of the ſtoves and the other places in which poultry are kept, draw thither beſides great numbers of ſmall flies, which they readily catch and eat very greedily.

A chicken juſt hatched has a craw, which may be filled with a quantity of food equal in ſize only to a pea; at the end of ſome weeks that craw will be capable of containing the bulk of a common cherry: and from hence it may be obſerved that what it will coſt daily at that age either in bread or in millet, can come to very little. But as the chickens grow, the capacities of their craws muſt encreaſe alſo conſiderably, and it will then be worth while to conſider, how to provide them with food, at a ſmall expence. The ſorts of grain with which poultry may beſt be fed, are oats, buckwheat, barley, *Turkiſh* corn, rye, and wheat.

Mr. *de Reäumur* has ſucceſſively fed ſeveral hens, with all theſe different kinds of grain, to inform himſelf if they eat equal quantities of the ſeveral ſorts: and here follows what ſeveral repeated experiments have taught him upon that ſubject.

A common hen that has all the day long grain at her will, eats in a day $\frac{8}{32}$ of a meaſure of barley, buck-wheat, or oats, but ſhe will not eat more than $\frac{6}{32}$ of a meaſure of wheat, $\frac{5}{32}$ of a meaſure of *Turkiſh* corn, and only $\frac{3}{32}$ of the ſame meaſure of rye: by a meaſure is here meant the quantity of about one 48th part of a *Wincheſter* buſhel, or the 12th part of a peck *.

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* The tranſlator of this abſtract, being of opinion, that a juſt idea of the author's meaning could not in ſeveral places be conveyed to an *Engliſh* reader, unacquainted with the affairs of *France*; unleſs certain values in *French* money, and meaſures of capacity, by him mentioned, were reduced to ſuch others thereunto equivalent as are here in common uſe. He has therefore, throughout the abſtract, taken the liberty to tranſlate the prices of grain &c. as therein expreſſed in *French* money, into *Engliſh* money nearly of the ſame intrinſic value; upon the ſuppoſition that the *French Livre* is at this time equal to ten *Engliſh* pennies, and conſequently the *French Sol* equal only to an *Engliſh* half-penny: which is exact enough to anſwer any common purpoſe. He has alſo in reducing of the meaſures ſuppoſed, that the *French Boiſſeau* is equal to one third only of our *Wincheſter* buſhel, and conſequently the *Septier*, which contains twelve *Boiſſeaux*, only to our comb or meaſure of four buſhels. This ſuppoſition is not indeed exact, but ſufficiently near to the truth to anſwer the preſent occaſion: for the *French Boiſſeau*, which they divide into ſixteen *Litrons*, is ſaid to contain five hundred and ſe-

venty

One might imagine that thoſe ſorts of grain, of which a hen conſumes the leaſt, ſhould be the moſt heavy, and to try if it was really ſo, Mr. de *Reäumur* weighed all theſe different ſorts, and it appears by the table he has made, that buck-wheat weighs more than either barley or oats, and yet a hen to feed her requires as much buck-wheat in a day, as ſhe does either barley or oats, and ſhe will eat more wheat than oats, though wheat is a yet heavier ſort of grain.

Is it the taſte and the liking of the hens, that determines them to eat more of one ſort of grain than of others? To make a judgment of this, Mr. *de Reäumur* gave to ſeve-

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venty ſix cubic inches of *Paris*, which will be found equal nearly to ſix hundred and ninety nine cubic inches of *England*, the *Paris* inch being very nearly to the *Engliſh*, as ſixteen to fifteen; but the *Wincheſter* buſhel contains better than two thouſand one hundred and fifty like cubic inches, which laſt number divided by ſix hundred and ninety nine gives for its quotient a very little more than three. Again in the former part of this paper, he has tranſlated the word *Muid*, the name of a caſk, by that of hogſhead, which is alſo near enough to the truth for the deſign it is here uſed: though to ſpeak more exactly, the *Muid* is ſaid to contain two hundred and eighty eight *French Pintes*, according to which, the *French Pinte* being generally accounted equal to the *Engliſh* quart, the *Muid* will really contain nine gallons more than the *Engliſh* hogſhead, ſuppoſed to meaſure ſixty three gallons, or two hundred and fifty two quarts.

ral hens ſeveral ſorts of grain at the ſame time, ſometimes mixed together, and ſometimes ſeparate: and his experiments have taught him that it is not ſo eaſy as one would think, to determine which are the ſorts of grain that the hens like the beſt. It appeared to him that ſome eat more willingly that ſort of grain they had been already accuſtomed to, than the other ſorts that were alſo ſet before them. Again it appeared to him that the appetites of ſome others were encreaſed by a new kind of food. One meets with, ſays he, among them, examples of the ſame humourſome taſte, which we ſee ſo common in our own *ſpecies*. It however appeared to him in general that among the ſeveral ſorts of grain above ſpecified, rye was that, of which the hens were the leaſt fond.

It has been obſerved, that the quantity or the bulk of grain that is boiled, is thereby encreaſed. Mr. *de Reäumur* gives a table of this encreaſe of quantity, by which it appears that it is greater, in certain ſorts, than it is in others.

Many repeated experiments have alſo informed him, that conſiderably the greateſt number of the hens preferred the boiled grain, to that which was raw, and he even found that there was thus a ſenſible ſaving in the feeding them with grain which was boiled rather than with that which was not. The greateſt advantage upon this account was in the barley; and there was a ſaving of $\frac{2}{5}$ of the quantity, in the giving it to them boiled.

By Mr. *de Reäumur*'s experiments, a hen that is fed all the year at diſcretion with dry barley, a quantity of which equal nearly to a comb or four *Wincheſter* buſhels, coſts ſix ſhillings and three pence, according to its mean price laſt year at *Paris*, will ſtand her owner in about three ſhillings: but if ſhe is fed with boiled barley inſtead of raw, ſhe will not coſt him in the year more than two and twenty pence half penny: if ſhe is at liberty to go about and pick up among the dung and in the yard, worms and inſects, ſhe will hardly then coſt him ſo much as a ſhilling, and if laſtly beſides that, ſhe is at liberty to eat as much graſs as ſhe is naturally inclined to do, ſhe will not in the whole year put him to the expence of above ſix pence in corn.

Mr. *de Reäumur* to make out otherwiſe, that this valuation of what the feed of a hen may coſt in a year, is tolerably near to the truth, gives another example more in the great, of what his own back yards have lately ſtood him in. His hens are at full liberty to ſtray about thoſe yards, in which they find both graſs and inſects. He there keeps a very great number, and he finds that by judging of what they can eat in a whole twelvemonth; by what they actually did eat, during the months of *November* and *December* preceding, a hen does not conſume more than about the third part of a buſhel of raw barley in a whole year, and which coſts upon the ſuppoſition above laid down but very little more than ſix pennies.

Again, barley is cheaper in the countries than it is at *Paris:* and that is not beſides the only reaſon, why a hen ſhould yet be leſs expenſive to keep in the country, than ſhe is in a great city. When they have very large places to ſtray over, the dunghills and the green ſwerds, furniſh them abundantly with food of various ſorts. It would alſo be eaſy to carry into the fields whole troops of chickens, and thoſe to chooſe which had been hatched, and raiſed in ſtoves; and which have never been accuſtomed to follow a hen: ſince, as much greater numbers of theſe have been hitherto brought up together, they will naturally be more enclined ſtill to keep together; and they are beſides a great deal more familiar.

But without turning the poultry out of the yards, one may even feed them there, with the ſame proviſions that they would find in the fields. One might eaſily get together herbs and inſects of diverſe ſorts, and eſpecially earth worms, which they are much fonder of, than of any other nouriſhment.

The labour required for the looking after the ſtoves, in which chickens are hatched, and for the bringing up thoſe chickens afterwards, cannot come to any thing very conſiderable; ſince one ſingle perſon would be able to look after ſeveral ſtoves, and to raiſe an immenſe number of chickens.

Thoſe perſons in the country, who have about them conveniencies for the raiſing of poultry, would hardly perhaps be ſolicitous about the having of ſtoves to hatch their chickens in: wherefore it might poſſibly be more deſirable, that ſome perſons only in villages ſhould employ themſelves this way, who would make it their chief buſineſs to keep ſtoves, to take in for a proper conſideration, eggs from their neighbours, and to bring up the chickens hatched from them, till they ſhould be able to ſhift for themſelves.

It is about great towns, and principally in the neighbourhood of the capital city, that it would be of the greateſt importance, to promote the eſtabliſhment of this ſort of ſtoves. And thoſe would miſtake, who ſhould imagine that the more diſtant provinces are the propereſt places, to encreaſe the poultry in, becauſe it may there be brought up at the leaſt expence. For it is not to be expected, that poultry can, like oxen be brought to town, from the diſtance of three or four hundred miles; the charge of driving an ox ſo far, conſidering how many are drove together, makes but a ſmall part of its prime coſt, whereas in tranſporting of chickens from ſuch diſtances, the expence of the journey would exceed many times, that of their firſt purchaſe, without including the hazard of their dying or loſing their fleſh, in ſo long a journey.

In the countries and provinces a great way from *Paris*, the price of a couple of chickens is very little more than that of a pound of butcher's meat, for when ſuch a pound of meat is ſold for ſeven farthings or two-pennies, a couple of chickens may be had for the ſame price: whereas in *Paris* a couple of chickens will coſt about as much as five pounds of meat; for when butcher's meat is ſold there for three pence half-penny or a groat a pound, a couple of chickens are ſold for about twenty pence. If therefore chickens could be brought from as far off as oxen are driven, and that the bringing of them did not, in proportion, coſt more money than the bringing of the cattle, a couple of chickens ſhould not be worth more at *Paris* than about a groat, or five-pence at the moſt, becauſe of the greater duty upon chickens than upon butcher's meat.

If there are certain places where it is of greater importance than in others, to employ ſtoves for the encreaſing of the breed of chickens, there are alſo ſeaſons when it will be more profitable to apply one's ſelf to promote ſuch an increaſe; and thoſe ſeaſons are at the times when birds of all ſorts generally leave off ſetting. But this way there will be no ſeaſon, in which one may not be able to promiſe one's ſelf young chickens, young pullets, turky-pouts, ducklings, and green geeſe: for one may hatch in ſtoves in every month of the year, eggs of all theſe ſeveral ſorts of fowls. It is indeed true that hens lay but a very few eggs in the winter, yet one may hatch during all the month of *October*, the eggs that ſhall have been laid towards the end of *September*; and thoſe eggs that ſhall have been kept in a cool or not too hot a place, will be very capable of being hatched, after they ſhall have been kept for ſix weeks or even two months. And the laying of hens and other domeſtic fowls will begin again before the end of *January*.

Nobody is ignorant how great a part of the ſuſtenance of the people in the country, and even of thoſe alſo who live in great towns, conſiſts of eggs in ſome way or other; and conſequently the increaſe of the abundance of eggs is no leſs deſirable, than that of chickens themſelves: and how can ſuch an abundance be any way ſo well brought about, as by encreaſing the number of the hens? or what comes to the ſame thing, by the hatching a great number of chickens? It has been obſerved above, that this affair is carried in *Egypt* to ſuch a height, as that they are there able to ſell eggs at about two and twenty pence, or at moſt, half a crown a thouſand.

The interruption which there is every year in the laying of eggs, is not only to be attributed to the cold, it is alſo the approach, the continuation, and the conſequences of the moulting, that ſuſpend the laying of the hens. Mr. *de Reäumur* propoſes to make ſome trials, whether it might not be poſſible, to alter the time of the moulting of ſeveral of his hens; and the expedient which ſeems to offer itſelf for that purpoſe, is the haſtening and bringing on ſooner their moult, by the plucking away by little and little a conſiderable part of their feathers.

It is very important to be able to preſerve eggs, whether for the procuring to one's ſelf the uſe of them at the ſeaſons when they are ſcarce, or to be able to carry them to ſell, at diſtant markets.

Mr. *de Reäumur* taught us long ſince, that the way to preſerve eggs is to varniſh them, and thus they may be preſerved for ſeveral months together, or even during the ſpace of a whole year, as freſh as when they were but juſt laid. He now points out to us an expedient yet more ſimple, and at the ſame time equally efficacious: and that is only lightly to ſmear over their ſhells, with butter, with greaſe, or with oil. There is alſo another manner to have eggs, that may be kept a great while without ſpoiling, and which cannot but be looked upon as ſomewhat curious; this method conſiſts in the procuring of barren eggs, or ſuch as have no germs, that is, ſuch as have never been impregnated by the male; for ſuch eggs will not at all corrupt and grow rotten, even though they are ſet for a long while together under a hen, or kept as long in a ſtove.

Hens, which go about freely with the cocks, do ſometimes nevertheleſs lay barren eggs. But one cannot be aſſured, that the eggs which they lay are barren, unleſs they have been kept apart from any cock for ſome ſpace of time. And experience has ſhewed, that the treading of a cock will be ſufficient to make all thoſe eggs fruitful, which ſhall be laid afterwards for above a month together.

The advantages of the ſtoves, for the hatching and bringing up of chickens, which have hitherto been inſiſted upon, are thoſe which are generally looked upon as the moſt real. Yet ſhould we not look with indifference upon certain other advantages, that may alſo be expected from them. They may be of uſe to procure, to ſuch as are ſtudious of natural hiſtory and philoſophy, the knowledge of ſeveral new facts, and the confirmation and more perfect underſtanding of many others, which they may before have been made acquainted with.

There are no ſorts of obſervations more proper to inſtruct us in the admirable ways by which nature brings about, the developement of the firſt germs of animals, by what means ſhe brings on thoſe germs to the ſtate of viſible embrios, and laſtly thoſe embrios to the ſize and ſtrength of animals fit to be turned out into the world: no ſort of obſervations, I ſay, are more proper to inſtruct us in theſe things, than thoſe which may be made upon what paſſes in the inſide of the eggs of birds, from the beginning to the end of the time of their incubation.

The ſtoves will at leaſt put us into the ability, of breaking at the ſame time a number of eggs, ſufficient to ſhew us at one view, a complete ſeries of all the degrees of their progreſs from the firſt to the laſt;

and we ſhall thus be able at once to compare all thoſe degrees with one another: whilſt we may beſides at the ſame time aſſure ourſelves of the reality of their difference, by breaking together ſeveral of thoſe, that ſhall have been placed at the ſame time in the ſtove, and that are conſequently in the ſame degree of their progreſs from their firſt incubation. The compariſons that may be thus made will be far more exact, than what can be deduced from the drawings of any of thoſe, who have taken the pains, and that with much leſs advantage, to repreſent to us the daily progreſs of the embrios in eggs, till they come to perfection.

Nothing can be more proper to furniſh thoſe who are ſo diſpoſed, with amuſements truly philoſophical, with amuſements from which they may expect both curious and uſeful knowledge; than the obſervations that may be made upon the facts that will ſeverally be preſented by the different ſorts of poultry in a yard well ſtocked with thoſe creatures. Thoſe which ſhall have been hatched in ſtoves, brought up without parents, and without any communication with others of their own kind, will particularly merit our attention. And it will moſt probably be found, that they will have the ſame taſtes, the ſame inclinations, and the ſame induſtries, as thoſe others that ſhall have been raiſed, in a manner more conformable to the ordinary courſe of nature. We ſhall from hence be able to conclude, that young birds have no need of inſtruction from their parents; as they will already have been ſufficiently directed, by that GREAT MASTER, who has never failed to teach all his animated creatures, whatever it was neceſſary or proper for them to know. If, for example, it ſhall appear, that the chickens hatched and brought up in this new manner, will diſcover to us by their cry, that they are affrighted whenever they ſee in the air a bird of prey; we ſhall then certainly be well aſſured, that it is no other than the GREAT AUTHOR of nature, who has thus given them the knowledge of the enemies they have to apprehend. And if it ſhall appear, that the ſparrows, the chaffinches, and the other ſmall birds which ſhall have alſo been hatched in the ſtoves, and reared without any communication with others of their own kind, ſhall each of them, at the proper ſeaſon, build their ſeveral neſts, with the art and contrivance peculiar to their ſpecies: one muſt ſurely agree and be perſuaded, that this art is as natural to them, as the circulation of the blood is, in their veins and arteries.

There is a ſingularity much admired in thoſe little ſparrows, commonly called *Amadevats*, which we receive from *Bengal*, which is, that after moulting they often become of a very different colour from that they were of before. But if one gives a particular attention to the cocks and hens, with which a good poultry yard is generally ſtocked, there will probably be found ſuch among them alſo, as undergo the like changes. And Mr. *de Reäumur* has obſerved, upon this head, ſome facts at home, that would hardly have been expected.

Turkies, ducks, and geeſe, are among thoſe fowls that are looked upon as part of the neceſſary ſtock of a back yard; theſe ſpecies of fowls, together with thoſe of the different ſorts of hens, are ſufficient to give ample room for the obſervations and compariſons, that may be made concerning the different genii of the birds of ſeveral ſorts, concerning the principal varieties of their forms, and upon their inclinations ſeverally relative to thoſe forms.

The alliances that might be made from year to year, between the hens and the cocks of different kinds, would render yet more intereſting and more entertaining the phænomena they ſhould preſent. It will be however neceſſary to take care, that all theſe ſeveral ſpecies, may not ſo far be confounded, as to be at the laſt entirely loſt: and Mr. *de Reäumur* points out the expedients neceſſary to preſerve thoſe ſeveral ſpecies, and to prevent that inconvenience.

But theſe alliances between birds of different kinds, might perhaps give ſome light to a queſtion, that ſtill divides ſeveral of our beſt naturaliſts. Some will have the original germs to be naturally in the female, whilſt others are of opinion, that they are only conveyed to her from the male in generation. Different kinds of mules, might poſſibly have afforded ſome inſight into this very curious queſtion, if ſufficient attention had been hitherto given, to what they ſeem reſpectively to derive from either parent. Mr. *de Reäumur* makes mention of two different ſpecies of cocks and hens, which differ from all the reſt by very diſtinct characters;

racters: and he thinks that alliances between theſe ſpecies, and thoſe of the more common ſorts, might alſo be of uſe to furniſh arguments, for judging to which of the two ſexes the germs did originally belong.

It is very difficult to give any clear and diſtinct idea, by way of abſtract, of a work that contains a very great number of very curious and very intereſting particulars. Such is the work of which we have been endeavouring to give ſome ſort of account: but by which we have rather propoſed, to incite others to read the book it ſelf carefully and throughout, than attempted to lay before them, by an enumeration of its contents, how many particulars in it, do well deſerve their notice and attention.

FINIS.